

REDESCRIPTION AND SYSTEMATIC PLACEMENT OF *OREADOMYIA ALBERTAE*  
KEVAN AND CUTTEN-ALI-KHAN (DIPTERA: CHIRONOMIDAE)

D. R. Oliver

Biosystematics Research Institute

Agriculture Canada

Ottawa, Ontario, Canada K1A 0C6

*Quaestiones Entomologicae*

17:121-128 1981

ABSTRACT

*The female of a small micropterous fly, Oreadomyia albertae Kevan and Cutten-Ali-Khan, is redescribed. Based on attributes of the female terminalia it is transferred from the Nymphomyiidae to the Chironomidae. Division of gonapophysis VIII into three lobes, absence of an anal point from sternum VIII, flagellum with less than 14 flagellomeres and absence of setae from the postnotum places it in the subfamily group Chironominae + Orthoclaadiinae + Prodiamesinae + Diamesinae. Although no synapomorphies could be found Oreadomyia is tentatively placed in the Orthoclaadiinae.*

RÉSUMÉ

*On redécrit la femelle de la petite mouche microptère Oreadomyia albertae Kevan and Cutten-Ali-Khan. Les caractéristiques des terminalia de la femelle font passer cette mouche des Nymphomyiidae aux Chironomidae. La division de la gonapophyse VIII en trois lobes, l'absence d'une pointe anale sur le sternite VIII, la présence d'un flagellum comportant moins de 14 flagellomères et l'absence des soies sur le postnotum suggèrent de classer cet insecte dans le groupe de sous-familles suivantes: Chironominae + Orthoclaadiinae + Prodiamesinae + Diamesinae. Bien qu'on ait trouvé aucune affinité synapomorphique pour un groupe déterminé, on range provisoirement Oreadomyia parmi les Orthoclaadiinae.*

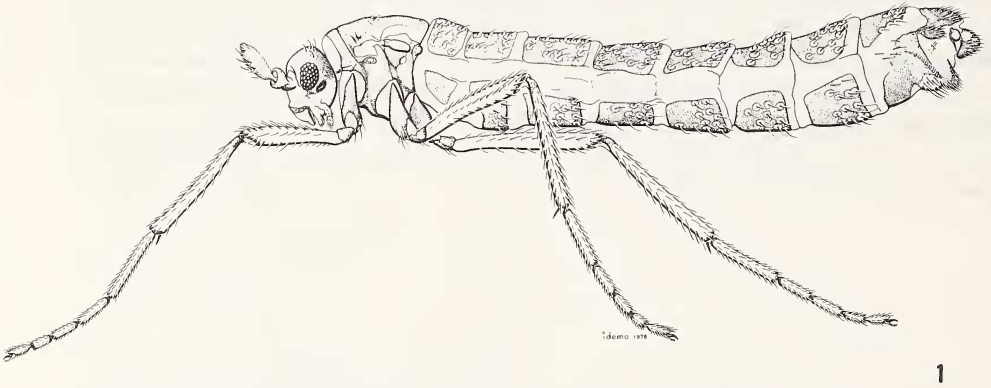


Fig. 1. *Oreadomyia albertae*, lateral view of female.

Kevan and Cutten-Ali-Khan (1975) described a small micropterous fly, *Oreadomyia albertae*, and placed it in the family Nymphomyiidae. Only a single female is known. This insect is obviously incapable of flight and exhibits many modifications in head and thoracic structures generally associated with flightless behaviour. Many characters, such as wing venation, normally used for systematic placement, are unavailable. The terminalia appear relatively unmodified and Saether (1977) has recently demonstrated the usefulness of this structure in determining systematic position. The structure of the terminalia shows that *Oreadomyia* belongs in the Chironomidae. This systematic placement, and its position within the Chironomidae, is discussed here. A redescription of the holotype, augmenting the original description of Kevan and Cutten-Ali-Khan (1975), is given also.

The type specimen, originally preserved in ethanol, has been mounted in Canada Balsam on a microscope slide. Terminology of the female terminalia follows that of Saether (1977).

### Redescription of *Oreadomyia albertae* Kevan and Cutten-Ali-Khan

#### Female (Fig. 1)

Antenna. Three-segmented. Scape large, saucer-shaped, diameter subequal to that of pedicel; without setae. Pedicel sub-globular with an apical cup-shaped depression; without setae. Flagellum (Fig. 2) undivided, clavate with a narrow, short base inserted into cup-shaped depression of pedicel; with two longitudinal rows of five sensilla basiconica each; setae short, basally in two irregular rows; apex without strong seta.

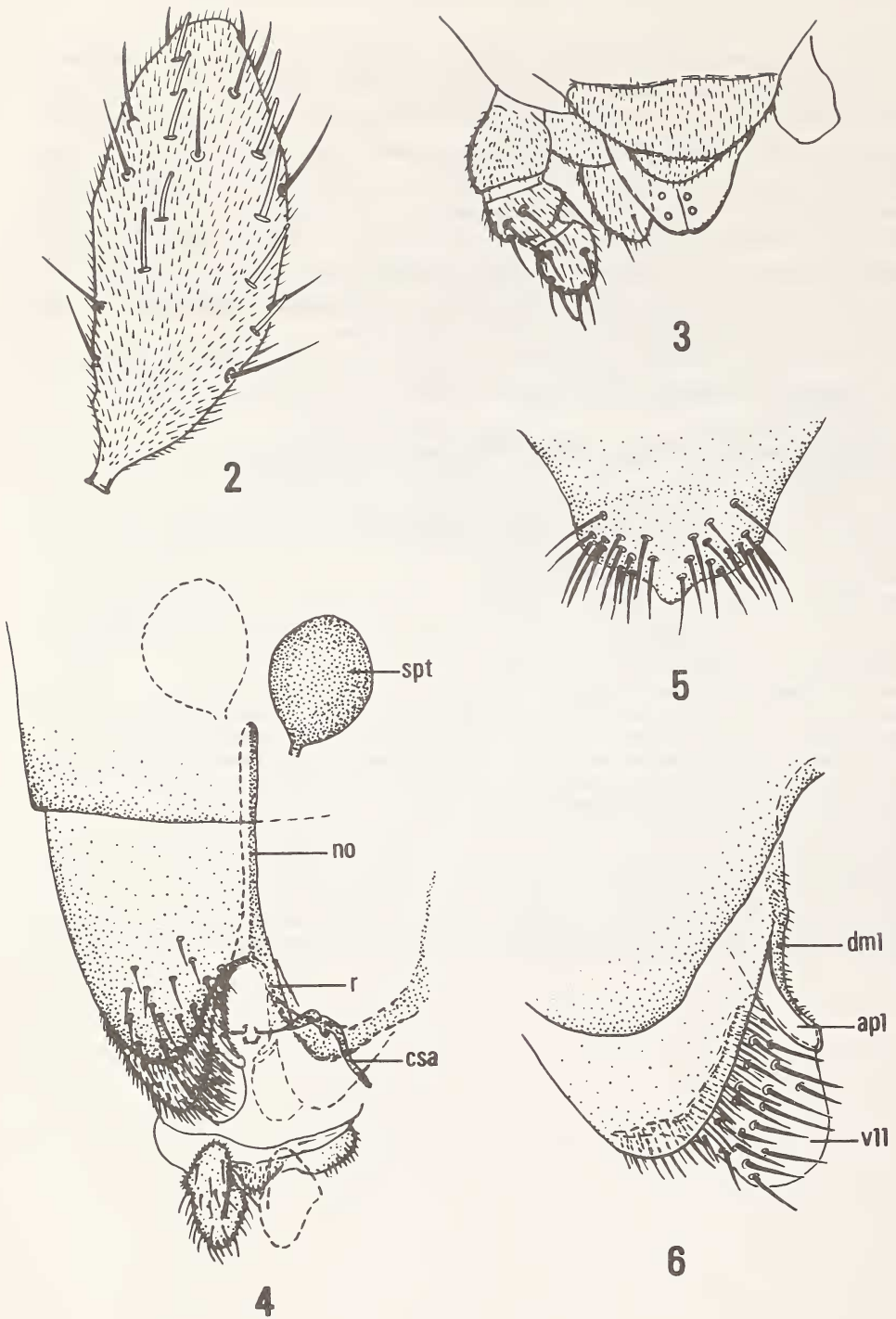
Head. Rounded with dome-shaped vertex, small ellipsoidal eyes and short mouthparts. Vertex with six or seven setae per side; coronal suture incomplete; coronal triangle absent. Individual ommatidia of eye enlarged. One darkly pigmented larval eye (stematic bulla), without ommatidia, lying posteroventral to eye. Clypeus (Fig. 3) subtriangular, without setae. Maxillary palpus (Fig. 3) with three discernable segments.

Thorax. Broad anteprenotal lobes completely fused medially; one ventrolateral seta present. Limits of dorsally flattened scutum, scutellum, and postnotum obscure, but transverse row of four setae may be scutellar setae; acrostichal and supra-alar setae absent; one seta present on each side of scutum midway between anteprenotum and transverse row of setae, may be dorsocentral setae. Anepisternum and katepisternum compressed by enlarged coxae. Anapleural suture not evident. Anterior spiracle appearing to lie in anterior part of anepisternum not in anepisternal cleft. Halter absent, but metanotum with low protuberance in usual position of halter base.

Wing. Narrow, strap-like, and shorter than one-half of length of thorax. Venation not discernable except for traces of radial vein evident in basal third.

Legs. Long, relatively thick with enlarged coxae. Fore L.R. ca. 0.58. One short, straight tarsal spur on each leg; basal one-third to one-half of each spur encircled with fine spines; hind tibial comb absent. Fourth tarsomere slightly widened apically, shorter than length of fifth tarsomere. Claws apically pointed; empodium plumose; pulvilli absent.

Abdomen. Segments I-V somewhat dorsoventrally flattened, remaining segments cylindrical and progressively larger posteriorly.



Figs. 2-6. *Oreadomyia albertae*, female. Fig. 2, flagellum. Fig. 3, maxillary palpus and clypeus. Fig. 4, ventral views of terminalia.— csa: coxosternapodeme IX, no: notum, r: ramus, spt: spermatheca. Fig. 5, dorsal view of tergum, IX. Fig. 6, ventral view of gonapophysis VIII.— apl: apodeme lobe, dml: dorsomedial lobe; VII: ventrolateral lobe.

Terminalia (Fig. 4). Gonapophysis VIII divided; ventrolateral lobe large, rounded, with moderately long setae; dorsomedial lobe narrow; apodeme lobe distinct, without microtrichia (Fig. 6). Coxosternapodeme IX curved. Notum extending anteriorly into abdominal segment VII; rami diverging around anterior part of genital cavity. Tergum IX undivided with caudomesal projection; setae in two groups, one on either side of narrow bare median area (Fig. 5); about one and one-half times as long as gonocoxite IX. Gonocoxite IX setiferous. Segment X without setae. Postgenital plate weak. Cercus one-segmented; pediform. Two ovoid spermathecae; without microtrichia.

### Holotype female

Bald Hills, Jasper National Park, Alberta ( $52^{\circ} 43' N$ ,  $117^{\circ} 41' W$ ; elev. 7200'), 19-31 Aug. 1970, P. Kuchar; Type No. 16041, deposited in Canadian National Collection, Ottawa.

*Remarks.* - *Oreadomyia albertae* resembles the antarctic midge, *Belgica antarctica* (Jacobs) - compare Fig. 1 with fig. 1E in Wirth and Gressitt (1967). Both have narrow strap-like wings, no halteres, dorsally flattened thorax, enlarged coxae and strong legs, and a rounded head with small ellipsoidal eyes and reduced mouthparts. They differ in antennal structure. The female of *Belgica* has four flagellomeres whereas *Oreadomyia* has only one. They also differ in structure of the terminalia, notably in that *Belgica* lacks a well defined apodeme lobe.

A double row of five sensilla basiconica suggests that the flagellum of *Oreadomyia* originated by fusion of six flagellomeres. In other female chironomids the apex of each flagellomere, except the terminal one, bears a pair of sensilla basiconica. The terminal flagellomere also bears sensilla basiconica, but these are arranged in one row or are scattered. The apical spine-like seta described by Kevan and Cutten-Ali-Khan (1975; figs. 1C and 1D) is not present. They also considered the flagellum to be two-segmented. The second being a "very small, apparently undivided, finger-like, subapical terminal segment." This could be a misinterpretation of a sensillum basiconicum. Kevan and Cutten-Ali-Khan (1975; figs. 1C and 1D) described the eye as being composed of two parts, each with ommatidia. The posteroventral part is composed only of pigment and is clearly without ommatidia. It does not appear to be part of the adult eye but a remnant of the larval eye spot, and therefore not a vestige of the ventral eye-bridge found in the Nymphomyiidae.

### SYSTEMATIC POSITION

Kevan and Cutten-Ali-Khan placed *Oreadomyia* in the Nymphomyiidae "principally on the basis of the characteristic form of the antennae". The shape of the ommatidia and general habitus were also considered. The antenna of *Oreadomyia* and those of some Nymphomyiidae, e.g., *Felicitomyia* and *Palaeodipteron*, are similar in that the flagellum is club-shaped. However, the flagellum of Nymphomyiidae has an apical spine-like seta, a subterminal group of sensilla, and an annulated basal part. *Oreadomyia* lacks the spine-like seta, the sensilla basiconica are arranged in two rows, and the flagellum consists of a single undifferentiated flagellomere. Many other differences in detail between the Nymphomyiidae and *Oreadomyia* also occur in other head and thoracic structures (see comparison given in Kevan and Cutten-Ali-Khan 1975). Also the female terminalia differ fundamentally. Cerci are two-segmented and gonapophysis VIII is long and undivided in the known Nymphomyiidae (Saether 1977). In *Oreadomyia* the cerci are one-segmented and gonapophysis VIII is relatively short and tri-lobed.

Attainment or transition to flightlessness in chironomids and other nematocerous Diptera frequently is accompanied by modifications of head and thoracic structures (Brundin 1966; Downes 1969; Hackman 1964; Hansen and Cook 1976; Hashimoto 1962). These structural modifications are usually reductions, e.g., male antenna becoming female-like, reduced eyes, brachyptery and flattening of the dorsum of the thorax. Legs are often strengthened and the male terminalia may be enlarged and heavily sclerotized, but the female terminalia are relatively unmodified. In cases of extreme reduction many characters normally used for systematic placement are unavailable.

The female of *Oreadomyia* is flightless. Newly emerged nymphomyiid adults are fully winged (Kevan and Cutten-Ali-Khan 1975) but the wings are apparently deciduous (Cutten and Kevan 1970) and some activity occurs in a flightless state. Similarities between some of the apomorphies occurring in the two groups are probably due to convergence resulting from loss or reduction in flight activity. Differences in detail of these apomorphies suggest that either the ancestral condition was different or the reduction process followed different pathways.

Apomorphies that arise by loss or reduction have limited value in determining phyletic relationship because of difficulty in recognizing convergence (Brundin 1976), especially if the selection of the apomorphies correlates with a particular mode of behaviour such as attainment or transition to flightlessness. Evidence of relationships should be sought in complex structures, such as female terminalia. Division of gonapophysis VIII into three lobes is a synapomorphy which places *Oreadomyia* within the Chironomidae. This apomorphy does not occur in any other family of Diptera and within the Chironomidae it only occurs in the Buchonomyiinae and its sister group, Chironomidae + Orthocladiinae + Prodiamesinae + Diamesinae (Saether 1977; Brundin and Saether 1978).

The presence of several apomorphies shows that *Oreadomyia* cannot belong to the Buchonomyiinae. The flagellum of the Buchonomyiinae has 14 flagellomeres and less than 14 flagellomeres is synapomorphic for its sister group (Brundin and Saether 1978). Use of this synapomorphy is admittedly tenuous because of the highly reduced state of the antenna of *Oreadomyia*. However, there is evidence that the extreme apomorphic state of the antenna arose by fusion of six flagellomeres (see Remarks). The postnotum of *Oreadomyia* lacks setae which is a synapomorphy for the subfamily group Chironomidae + Orthocladiinae + Prodiamesinae + Diamesinae (Brundin and Saether 1978). These setae are present, the plesiomorphic character state, in the Buchonomyiinae. Also the presence of an anal point on sternum VIII is synapomorphic for the Buchonomyiinae. The plesiomorphic character state, lack of this anal point, exists in *Oreadomyia*, as well as in the subfamily group Chironomidae + Orthocladiinae + Prodiamesinae + Diamesinae.

Placement within the subfamily group Chironomidae + Orthocladiinae + Prodiamesinae + Diamesinae is difficult because of the extreme reduction of the female of *Oreadomyia* and lack of information about male and immature stages. It keys to couplet 17, containing the Orthocladiinae and Chironomidae, in the key to subfamilies and tribes of Chironomidae by Saether (1977). Of the three characters given in couplet 17 only the third, the tarsal spurs, is of use in placing *Oreadomyia*. They are clearly of the type occurring in the Orthocladiinae, eliminating the Chironomidae from contention. The structure of tergum IX does not fit any of the alternatives given in couplet 17 (Saether 1977) and a bare segment X occurs in both subfamilies. Interpretation of tergum IX character is ambiguous. However, it should be noted that although the structure of tergum IX is not clearly either Orthocladiinae or Chironomidae it resembles that of *Diplocladius*, a member of the Orthocladiinae.

It is not possible to present phyletic evidence in support of the placement of *Oreadomyia* in the Orthoclaadiinae, as no synapomorphies were found to conclusively eliminate the Prodiamesinae and Diamesinae. The Diamesinae is regarded as the sister group of the Chironomidae + Orthoclaadiinae + Prodiamesinae, and the Prodiamesinae the sister group of the Chironomidae + Orthoclaadiinae (Saether 1977). The female of *Oreadomyia* has a long notum. This is regarded as synapomorphic for Chironomidae + Orthoclaadiinae + Prodiamesinae (Saether 1977:31), which would suggest elimination of the Diamesinae. However, the dividing point between a long and a short notum is arbitrary and Saether (1977:60) later states that the notum in the Diamesinae is "short to long". Equally unsatisfactory is the use of the rami to distinguish the Prodiamesinae. According to Saether (1977) the presence of parallel-sided rami is synapomorphic for the Prodiamesinae. But this character is not shared by all Prodiamesinae as the rami of *Odontomesa* are not parallel-sided (see Fig. 35C in Saether 1977). Saether (1977) has provided a basis for the study of female chironomids, however, more detailed studies are required before the phyletic relationships of reduced forms such as *Oreadomyia* can be deduced solely from female terminalia.

#### ACKNOWLEDGEMENTS

I wish to thank A. Borkent, J.F. McAlpine and D.M. Wood for discussion and critical comments on the manuscript. Fig. 1 was drawn by R. Idema.

#### REFERENCES

- Brundin, L. 1966. Transantarctic relationships and their significance as evidenced by chironomid midges. With a monograph of the subfamilies Podonominae and Aphroteniinae and the austral Heptagyiae. Kungliga Svenska Vetenskapsakademiens Handlingar. (4) 11: 1-472.
- Brundin, L. 1976. A Neocomian chironomid and Podonominae-Aphroteniinae (Diptera) in the light of phylogenetics and biogeography. Zoologica Scripta. 5: 139-160.
- Brundin, L., and O.A. Saether. 1978. *Buchonomyia burmanica* sp. n. and Buchonomyiinae, a new subfamily among the Chironomidae (Diptera). Zoologica Scripta. 7: 269-275.
- Cutten, E.A., and D.K.McE. Kevan. 1970. The Nymphomyiidae (Diptera), with special reference to *Palaeodipteron walkeri* Ide and its larva in Quebec and a description of a new genus and species from India. Canadian Journal of Zoology 48: 1-24.
- Downes, J.A. 1969. The swarming and mating flight of Diptera. Annual Review of Entomology. 14: 271-298.
- Hackman, W. 1964. On reduction and loss of wings in Diptera. Notulae Entomologicae. 44: 73-93.
- Hansen, D.C., and E.F. Cook. 1976. The systematics and morphology of the Nearctic species of *Diamesa* Meigen, 1835 (Diptera: Chironomidae). Memoirs of the American Entomological Society. 30: 1-203.
- Hashimoto, E. 1962. Ecological significance of the sexual dimorphism in marine chironomids. Science Reports of the Tokyo Kyoiku Daigaku. 10: 221-252.
- Kevan, D.K.McE., and F.E.A. Cutten-Ali-Khan. 1975. Canadian Nymphomyiidae (Diptera).

Canadian Journal of Zoology. 53: 853-866.

- Saether, O.A. 1977. Female genitalia in Chironomidae and other Nematocera: morphology, phylogenies, keys. Bulletin of the Fisheries Research Board of Canada. 197: 1-209.
- Wirth, W.W., and J.L. Gressitt. 1967. Diptera: Chironomidae (Midges) pp. 197-203. In J.L. Gressitt (ed.) Entomology of Antarctica. American Geophysical Union. Antarctic Research Series. 10.